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University Research in the  
Information Economy: A Clash  
of Cultures







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## UNIVERSITY RESEARCH IN THE INFORMATION ECONOMY

### A Clash of Cultures

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#### Executive Summary

This research note has been written in response to the recent *National Conference on University Research and the Future of Canada* held in honour of J. Gordin Kaplan and organized by the University of Alberta in Edmonton, April 25th through 29th, 1988. The university is the traditional centre for the production and diffusion of knowledge in Western society. The Information Economy, however, involves the *monetization of information*. Contrary to popular misconception, within the Information Economy no premium is placed on the free flow of information. Traditional university research motivated by the search for *knowledge for knowledge's sake* conflicts with the ethos of the Information Economy and this conflict threatens the autonomy of the university.

Through time, there has been a progressive expansion in the sources of National Income. In this century, technological change has become recognized as the most important source of economic growth. However, our understanding of technological change has also evolved and changed. Today, there are three epistemological sources of what is popularly called technological change. Research in the physical sciences leads to improvements in physical technologies, the most obvious form of technological change. Research in the social sciences and the humanities leads to improvements in organizational technology, i.e. the ways and means available to organize and motivate capital, labour and physical technology. Research in the arts leads to improvements in advertising, consumer research, marketing and product design. Physical and social science research is centred in the university. Research in the arts is focused in the non-profit professional fine arts community.

Research, in dollars terms, represents a small amount of resources compared to existing capital stock and labour force. However, its role in economic growth is that of a catalyst stimulating changes and improvements in the quality and efficiency of capital and labour. Research results become embodied in abstract intellectual property rights including copyright, patents, registered industrial design and trade marks. It is the buying, selling and licensing of such rights that constitute the Quaternary Sector of the Post-Modern or Information Economy.

Not only do universities object to the increasing pressure from both government and the private sector to *directed or targeted* university research, in fact the contemporary culture of university research stands in stark opposition to the evolving nature of intellectual property legislation in the Information Economy. Compared to the arts, the university has been ineffective in exploiting such rights. This partially reflects that university research has traditionally been conducted without thought of financial gain to the university or researcher. As the Information Economy grows and expands, the university has three alternative ways of adapting: *defensive resistance* leading to *marginalization* of the university as a social institution; *collaboration* with private and public sector sponsors in conducting applied rather than pure research leading to a dangerous *dual loyalty* on the part of tenured faculty; and *creative offense* giving *explicit recognition to the central role of university research in the Information Economy* and establishing appropriate *terms-of-trade* with the public and private sectors to insure the autonomy of the university and funding for *curiosity-based research*.





If Canada moves ahead in the international science and technology race, the universities will deserve much of the credit. If we fall behind, or if the population comes to consider the scientist as an ivory-tower isolationist and science as a sinister force, the universities will have to accept much of the blame.

Senate Special Committee on Science Policy, *A Science Policy for Canada*, Ottawa, 1970, Volume 1 p. 21

## UNIVERSITY RESEARCH IN THE INFORMATION ECONOMY A Clash of Cultures

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### Introduction

This research note is written in response to the recent *National Conference on University Research and the Future of Canada* held in honour of J. Gordin Kaplan and organized by the University of Alberta in Edmonton, April 25th through 29th, 1988. The question of the role of university research in the emerging Information Economy was one of several critical issues raised during the conference. Resolution of this question will serve to determine the long-term competitiveness of national economies.

The university is the traditional centre for the production and diffusion of knowledge in Western society. The Information Economy, however, is based on the *monetization of information*. Contrary to a popular misconception, it does not place "a premium on the free flow of information" (Naimark May 6, 1988: A-7). The thesis of this research note is that traditional university research motivated by the search for *knowledge for knowledge's sake* conflicts with the ethos of the Information Economy and this conflict threatens the autonomy of the university.

Four aspects of this apparent clash of cultures will be examined. First, key definitions will be established. Second, the nature of National Income in the Information Economy will be examined. Third, traditional treatment of intellectual property rights resulting from university research will be examined and contrasted with the traditional practice in the arts. Finally, three alternative strategies available to the universities to respond to the emergent Information Economy will be outlined - *Defensive Resistance*, *Collaboration* and *Creative Offense*.

### Definitions

In exploring the relationship between University Research and the Information Economy, four basic definitions need to be established. First, Science is defined as systematic and formulated knowledge, thereby permitting inclusion of both the natural and social sciences. Research is defined as the systematic process by which scientific knowledge is developed and advanced. Art is defined as skill developed through practiced application. Therefore, art involves experiential as opposed to scientific learning. In part, it can be said that Science *knows* and Art *does*, or:

Whereas Art begins with desired effects and finds causes to create these effects and no others, Science starts with causes and seeks effects to confirm or negate these causes. Art organizes ignorance by precepts while Science organizes knowledge by concepts (Nevitt 1978:7).

Information is defined as items of knowledge, whether produced scientifically or otherwise. Technology is defined as the application of knowledge, both scientific and experiential for practical purposes. It is important to note the the word *technology* is derived from the Greek *teckne* meaning art combined with -ology derived from the Greek *logos* meaning reason. It is the changing roles of artistic and scientific knowledge as sources of technology which defines the evolution of the Information Economy.

### Information and National Income

To understand the nature of the Information Economy it is necessary to understand the evolving nature and sources of national wealth. Throughout history, what we have bought, invested in and paid taxes on, has changed. The total of all of these final demands is called National Expenditure. In symbolic logic, National Expenditure ( $Y_e$ ) can be expressed as:

$$Y_e = f(C, I, G) \text{ where}$$

$C$  = Consumption

$I$  = Investment

$G$  = Government.

Similarly, through time, the means by which we earn the income to consume, invest or pay taxes has come from a changing set of factors of production including capital, labour and technology. Taken together, these income flows are called National Income. In symbolic logic (using the conventional expression) National Income ( $Y_i$ ) can be expressed as:

$$Y_i = f(K, L, T) \text{ where}$$

$K$  = Capital

$L$  = Labour

$T$  = Technology.

In economics, National Expenditure and Income represent an accounting identity. The one is exactly equal to the other, and are said to be identical, or in symbolic logic:

$$Y_e = Y_i = Y.$$

Before the Renaissance and the Commercial Revolution (which introduced the double-entry ledger) economic theory was the domain of the Scholastics such as Thomas Aquinas. The Scholastics used theological concepts such as the Just Price and religious interdictions against interest to explain and guide economic behaviour. It was from this ethical root that emerged the moral philosophy of Bentham and the economics of Smith (Smith 1776). Since their time, however, there has been a progressive expansion of what are considered the sources of National Income ( $Y$ ). This expansion has involved a series of crises in confidence concerning previously accepted systems of economic thought (Keynes 1937).

#### *Pre-Classical or Mercantilist Period*

From the 16th until the end of the 18th century, it was accepted that only physical capital ( $K$ ), e.g. gold, silver and land, was productive of an economic surplus. In symbolic logic, the assumption that National Income ( $Y$ ) is a function of capital ( $K$ ) is expressed:

$$Y = f(K).$$

Through re-investment of this surplus in primary industries like farming, fishing and mining, it was believed that national wealth would increase. In fact, these were considered the only productive sectors of the economy. European conquest of the New World appeared to confirm this view. The English Pamphleteers and French economists Quesnay and Turgot were the dominant exponents of this theory of value (Schumpeter 1954). Today, these sectors make up what are called the Primary Industries of modern National Accounts. Monetarists and Gold Standard advocates continue to echo, in one form or another, this ancient economic dogma of value.

While the Royal Society was established in England in 1660 as a focus for the scientific method, technology during this period was essentially based on experiential knowledge developed by the guilds. Scientific information was largely symbolic of national wealth, i.e. a nation rich enough in gold could demonstrate its wealth through the pursuit of scientific knowledge.



### *Classical Period*

By the end of the 18th century, division and specialization of labour (L) combined with specialized industrial equipment (K) were accepted as productive of an economic surplus, i.e.

$$Y = f(K, L).$$

Investment in manufacturing industries was believed to increase national wealth. Smith, Ricardo, Malthus, Marx and James Mills were the dominant theorists of this period (Barber 1967). The success of the United Kingdom in the Industrial Revolution appeared to confirm this economic belief.

Manufacturing constitutes the Secondary Industries of contemporary National Accounts. Today some market economists believe that only the manufacturing of physical goods is productive of an economic surplus. On the other hand, there are Marxists who believe only the worker is productive. During this Classical period, services including scientific research were considered important social activities, but not productive of national wealth.

In fact, (Adam) Smith's usage of the term 'wealth' can, with one important qualification, be translated into modern terminology as 'national income'. The point at which Smith and today's national income accountants in Western countries part company turns on the definition of 'productive' activity. In Smith's view, only the outputs of the productive employments of labour should count in calculations of the social product. Virtually all 'service' activities were excluded, on the grounds they failed to yield either tangible products or reinvestable surpluses. This definition also reinforced Smith's general attitude towards a wide range of policy issues. It followed that all activities of governments were unproductive as well as "some both of the gravest and most important, and some of the most frivolous professions: churchmen, lawyers, physicians, men of letters of all kinds; players, buffons, musicians, opera-singers, opera-dancers, etc." (Barber 1967: 29)

In fact,

(t)he men responsible for technological innovations ... during the beginning of the Industrial Revolution were nonconformists who had been excluded from the universities and learned their science indirectly while pursuing their trade. In other words, the coupling between science and technology was very loose and did not rely on the established system of higher education (Senate Special Committee 1970: 21).

### *Neo-Classical Period*

By the mid- to late-19th century, systemic technological change (T) operating through perfectly competitive markets was recognized as productive of an economic surplus. Investment in improving financial markets, steam-powered transportation and enhanced communications such as the telegraph was believed to increase national wealth, i.e.

$$Y = f(K, L, T).$$

The success of the United States in developing a continental economy (Chandler 1962) appeared to confirm this belief. The dominant theorists of this period were John Stuart Mills and Alfred Lord Marshall (Mills 1848; Marshall 1890). This type of technology is called disembodied technology, i.e. it does not refer to the application of a specific item of scientific information in a specific product, but rather a general systemic improvement in economic functions like transportation and communications.

Today, finance, transportation and communications form part of the Tertiary Sector or Service Industries of the National Accounts. During this Neo-Classical period, government was generally considered an impediment rather than a source of national wealth. This was the period known as *laissez-faire* liberalism. Neo-conservatives who believe in setting business free through deregulation and shrinking the power and reach of government, accept this economic dogma of value.



It was during this period in England that technology and the applied arts became formalized in institutions of higher learning called *polytechnics*. The success of these institutions resulted in their eventual absorption into the tradition universities where the *pure* sciences and the scientific method combined with the applied sciences to produce the pattern of scientific learning we know today. Furthermore, in 1870 compulsory primary education was introduced in England which began the process of diffusing scientific and experiential knowledge to a wider proportion of the population than at any time in history. It is important to note, however, that the major innovations of the period, e.g. the telephone, telegraph and electric light did not result from university-based research but from the insight of independent inventors, who, like Bell and Edison, created their own research institutes outside of the university.

#### *Keynesian Period*

The Great Depression of the 1930s convinced most economists and policy makers that the perfectly competitive market was no longer the dominant form of industrial organization. Large scale industrial enterprise combined with widespread unionization required Government's active involvement to maintain full employment and price stability in the face of imperfect markets. Therefore, from the mid-1930s until the recessions of the late '70s and early '80s, Government (g) intervention was considered necessary to assure growth in National Income, i.e.

$$Y = f(K, L, T)^g$$

Government fine tuning of the economy and counter-cyclical management of aggregate demand were considered critical in assuring economic growth. As indicated in the equation, Government was assumed not to generate wealth directly, but rather to maintain and sustain its growth by assuring the efficient interplay of capital, labour and technology. Thus while tax cuts could stimulate growth, growth resulted from the return of resources to the private sector where improvements in the allocation and mix of capital, labour and technology were possible. In effect, the Government became recognized as responsible for setting the *rules of the game* for economic behaviour. The role of Government is recognized in the National Accounts as the Public Sector. Lord Keynes was the dominant theorist of this period (Keynes 1936). Liberals and social democrats committed to the active intervention of the State continue to hold this Keynesian economic theory of value.

During this Keynesian period of economic thought, art and science were recognized as *public goods*. It was accepted that if the social benefits of an activity could not be fully captured by private producers in the marketplace, then Government had a legitimate role to ensure that an appropriate quantity and quality were made available to the general public:

the arts are public goods whose benefits demonstrably exceed the receipts one can hope to collect at the box office. It is a long-standing tenet of economics that if the wishes and interests of the public are to be followed in the allocation of the nation's resources, this is the ultimate ground on which governmental expenditures must find their justification. Government must provide funds only where the market has no way to charge for all the benefits offered by an activity. When such a case arises, failure of the government to provide funds may constitute a very false economy (Baumol, Bowen 1966).

It was during this period that the university and university-based research became the dominant source of new technology including chemical, electrical and nuclear technologies. The war years confirmed that scientific knowledge could serve a major role in the development of technology. During this period, the concept of technological change evolved into *embodied* technological change, i.e. specific items of scientific knowledge were embodied in a specific product, e.g. the transistor radio. Conventional wisdom held that the era of the independent, nonconformist inventor was drawing to an end. However, this convention could be quickly swept away by the appearance of another Bell, Edison or Marconi.



### *Post-Modern Period*

The success of the world economy from the Second World War through the early '70s led most economists and politicians to accept the Keynesian creed that government intervention was the ultimate guarantor of growth and development. By the mid-'70s, however, stagflation, recession, the oil crisis, and growth of public sector debt created a crisis of confidence, a crisis predicted by Keynes himself.

Today, various economic theories and dogma compete for attention and acceptance. To an extent, the 1980s are a time of *Cultural Counter-Reformation* in which many strive to resuscitate values and beliefs swept away by the turbulent cultural revolution of the 1960s, and the economic crises of the '70s and '80s. This lack of confidence is similar to contemporary architecture in which the certainties of the modern or international style have been replaced by an eclecticism of design known as Post-Modern Architecture. By analogy, we have entered the era of Post-Modern Economics, an era without a generally accepted dogma, an era in which we must begin again a long trek for economic truth, understanding and public confidence.

At present, no single school of economic thought enjoys general public confidence. Various new schools have, however, emerged in recent years which share a belief that new factors of production have become the source of economic growth. Such new factors generally have been recognized through re-definition of older concepts such as capital (K) and technological change (T). In the case of capital,

A strong argument can be made that information capital is as important to the future growth of the American economy as money. Despite this perception, this intellectual capital does not show up in the numbers economists customarily look at or quote about capital formation... In saying that, I am not arguing that money capital will not continue to be very important; it will. But I am suggesting that the amazing accumulation of knowledge capital in the last twenty years is very substantial and growing every day but it is uncounted. We have little or no control over the natural resources within our borders, but we do have control over our educational and cultural environment... If we want better economic forecasting and better policies, clearly some way needs to be found to crank the growth of knowledge into our equations (Wriston 1985).

Revision of the traditional concept of technological change permits recognition of additional epistemological factors contributing to change. The role of technology in economic growth has further evolved from disembodied and embodied technological change to *epistemological* technological change, i.e. changes and differences in the nature and sources of knowledge.

The importance of breaking out the constituents of traditional technological change is evident when the contribution of technological change to the growth rate of output is considered.

(E)conomists working in this area ... conclude that less than one-third of the growth rate of output per worker over the years from the turn of the century can be attributed to the rise in capital per worker. Over two-thirds of the growth rate of output per worker has therefore to be attributed to all other factors covered by the catchall called technological advance (Shapiro 1970; 493).

Traditional technological change (T) results from research and development in the physical sciences, i.e. High Tech. \* It is generally accepted that this type of technological change leads to growth in national wealth. To the best of the author's knowledge there are no empirical studies that demonstrate a causal, i.e. scientific relationship between investment in physical research and development and growth in National Income. Theoretical and political belief in the argument, however, is strong. Various terms have been used to describe what, at any moment, is considered to be the most efficient physical technology. The term *leading edge* has been used. Similarly, the term *state of the art* has been applied.

Research in the social and management sciences results in improved Organizational Technology (O) which leads to growth in national wealth. Organizational technology influences the rate and capacity of a company or country to innovate. The economic impact of improved Organizational Technology on national wealth has been



estimated at 20 to 40% of the net national product of the United States (Leibenstein 1981). The Economic Council of Canada has also recognized the negative consequences of poor organizational technology in Canada (Economic Council 1985). The phrase which, in the face of superior Japanese organization, has become the touchstone for organizational success is *in search of excellence*.

Just as the physical sciences are the epistemological source of physical technological change (T) and social and management sciences are the source of theories and practices in bringing together people, property and money in production (O), the Arts are the source of improved Design (D). Research in the Arts, however, does not generally take place in the university. Rather, it emerges from the professional non-profit fine arts where *art for art's sake* is the dominant motivation (Chartrand 1987a).

The contribution that Design brings to the marketplace can be called *Elegance*. This term is also used in mathematics, the physical sciences and economics. It expresses *Occam's Razor*, a guiding principle of the scientific method: *The fewest assumptions for the maximum explanation*. Elegance can be defined as "ingeniously simple and effective" (Sykes 1985: 311). This catches the sense of "economy" as frugality.

Aesthetic Design is fundamentally different from advances in technical or functional design such as a better automobile engine. Its impact on consumer behaviour involves what has been called "the best looking thing that works" (Cwi 1985). If a consumer does not like the way a product looks, he or she may not even try it. Similarly, a rich endowment of natural resources does not guarantee a nation can effectively develop up-scale value-added products, e.g. Canada is the largest timber producing country in the world and yet imports Swedish IKEA furniture. This is not because Swedish pine is better, but rather due to superior design.

The growing importance of Aesthetic Design results from four fundamental demographic changes: rapid urbanization, rising levels of general education, the increasing participation of women in the economic and political process and aging of the population (Chartrand 1987c). It concerns four ill-perceived but increasingly important dimensions of economic competitiveness: advertising, consumer hedonics (Holbrook 1987), the emerging *narrowcast* marketplace and improved product design (Chartrand 1987d). While the impact of improved Aesthetic Design has not been quantified, its impact on economic competitiveness has been recognized.

There is, then, another aspect to culture, namely good taste, good design and creative innovation, that should enable smaller industrial economies to compete effectively in the world economy... In this endeavour, higher quality implies an organic relationship between business and engineering, on the one hand, and design and craftsmanship, on the other... High quality products, technologies, plants, homes, cities and locales require the presence of creative artists of all kinds. To increase the long-run supply of artists... governments must support the artists and the arts. The long-term return from investment in artists and the arts is real and substantial. In the absence of strong public support of this sector, Canada will not reap these benefits. Governments at all levels should increase their contribution to their respective arts councils (Royal Commission 1985:115-116).

Taken together these epistemological changes embrace technological change resulting from research in the physical sciences (T), improvements in organizational technology (O) resulting from social science research, and improvements in design (D) resulting from advances in the Arts (Shapiro 1970: 495) and can be expressed as:

$$Y = (K, L, T, O, D)^{\alpha}$$

The true source of the Post-Modern economic surplus is therefore Human Creativity including university research in all its forms. Such creativity is legally embodied in intellectual property including: *patents* (emerging from the physical sciences); *registered industrial design* (emerging from the physical sciences and the arts); *trademarks* (emerging from the arts), and *copyright* (emerging from the physical and social sciences, humanities and the arts). Managerial and industrial *know-how* also falls into this category of abstract goods and services. At present such abstract goods



**Exhibit 1**  
**The Evolution of National Wealth**

NATIONAL WEALTH (Y)	SECTOR OF NATIONAL ACCOUNTS	ADDITIONAL SOURCE OF NATIONAL WEALTH	THEORISTS	POPULAR EXPRESSION	ROLE OF RESEARCH
$Y = (K)$	<i>Primary Industries</i> Farming Fishing Mining	Capital (K) in the form of gold, silver and land conquered from other Nations  Spain in 17th century.	<i>Pre-Classical</i> English Pamphleteers Quesnay Tourgot	Monetarists and Gold Standard Advocates who believe in the primary role of the money supply	<i>Symbol</i>
$Y = (K, L)$	<i>Secondary or Manufacturing Industries</i>  Manufacturing	Division of labour (L) and specialized industrial machinery (K)  England in early 19th century	<i>Classical</i> Smith Ricardo Malthus J. Mills Marx	Marketeers who believe that only manufactured goods are the source of national wealth and  Marxists who believe that only labour is of economic value	<i>Unproductive</i>
$Y = (K, L, T)$	<i>Tertiary or Service Industries</i>  Communications Financial Services Transportation	Systemic technological change, (T) e.g. steam power and telegraph operating in perfectly competitive markets, particularly financial markets  USA in late 19th and early 20th centuries	<i>Neo-Classical</i> J.S. Mills Marshall	Neo-Conservative, who believe that Government must set business free and de-regulate the market place	<i>Productive</i>
$Y = (K, L, T)^9$	<i>Public Sector</i>	Large corporations and trade unions make perfect markets not possible, therefore Government (g) is required to fine tune changes in aggregate demand and adjust for social costs of externalities like pollution  OECD in mid-20th century?	<i>Keynesian</i> Keynes	Liberals and Social Democrats who believe it is the Government, not the marketplace which is the primary institution of social progress	<i>Merrit Good</i>
$Y = (K, L, T, O, D)^9$	<i>Quaternary Industries</i> Patents Trademarks Registered Industrial Design Copyright Know-How	Abstract goods and services result from research in the Physical Sciences from which Technology emerges (T); Social and Management Sciences from which emerges <i>Organizational Technology</i> (O); and the Arts from which Aesthetic Design emerges (D)  Japan in late 20th century?	<i>Post-Modern</i> Bell Liebsenstein Poray Toffler Valakakis Chartrand	State of the Art (T)  Excellence (O)  Elegance (D)	<i>Source</i>

and services constitute what can be called the Quaternary or Fourth Sector of the economy which is poorly reported in the National Accounts.

Simply put, it is the expansion of knowledge, skills, imagination, ideas and insights of working people that creates the margins from which physical capital is accumulated, leading to productive investments to further accumulation of capital (Ginzberg, Vojta 1981).

At any point in time, there exists a stock of capital and labour which embodies current and past technical and educational attainment. Technology, Organization and Design represent flows of new products, processes, organizational methods, styles and fashions. New scientific, organizational and design knowledge and skills results from what can be broadly called *research*, some of which becomes embodied in new and improved capital plant and equipment as well as in a generation of better educated and skilled workers.



Research, in dollars terms, represents a small amount of resources compared to existing capital stock and labour force. However, its role in economic growth is that of a catalyst stimulating changes and improvements in the quality and efficiency of capital and labour (Shapiro 1970: 490-91). The Information Economy is, in fact, based on the buying, selling and licensing of abstract intellectual property rights which together constitute the Quaternary Sector of the Post-Modern Economy.

In external trade the importance of these abstract goods and services can be roughly measured by invisible exports. In the United States, for example, it was invisible exports that minimized the impact of enormous price increases in petroleum imports during the 1970s and 1980s.

These "invisible exports", preponderately the yield from human capacity, particularly organizational and managerial capabilities, nearly offset the increased expenditure for petroleum imports that put the foreign-exchange account \$7 billion in the red (Ginzberg, Vojta 1981).

### **The University and the Impact of the Information Economy**

The self-governing university, i.e. independent of Church and State, emerged in the Occident during the 12th and 13th centuries. At its beginning this social institution was essentially an incorporated association of teachers, as in Paris, or students as in Bologna (Schumpeter 1954: 77-78). Before long these associations grouped themselves into *faculties* according to different branches of knowledge. From that time to the present, the university has enjoyed an unparalleled level of autonomy. This autonomy is reflected by the institution of tenure, i.e. life-long appointment based upon peer review or evaluation of the scholar. Tenure permits scholars to pursue intellectual interests free from the threat of dismissal. Research initiated through the interest of the individual scholar is called *curiosity-based or pure research* which involves the search for *knowledge for knowledge's sake*. Funding through many diverse sources of enlightened patronage, as in the arts, also provided multiple funding sources which enhanced the autonomy of the university and the researcher.

Through time, the role of the university has become defined as *education, research* (in the sense of the pursuit and production of knowledge) and *diffusion* of such knowledge to society. Traditionally such activities have been conducted without thought of financial gain to the university or to the researcher. In the past when new knowledge was viewed as a threat to peace, order and good government such a non-pecuniary approach was, without question, a necessary and critical stage in social evolution.

#### *Training and Research Relevance*

While primary and secondary education became State responsibilities in the later part of the 19th century, it was not until after the Second World War that the university began to feel pressure to become a useful or applied institution. Partially due to the success of primary and secondary education in graduating large numbers of students interested in higher education but more importantly due to the demonstrated impact of scientific research on the war effort, government began to fund universities, including university-based research.

By the mid-1960s, government funding had become the dominant source of university financing in Canada. Funding tended, however, to emphasis teaching as opposed to research. Thus, government grants were based on enrollment. Partially in response to the Cultural Revolution and unrest on the campus during the late '60s and early 1970s, governments froze funding to universities across the country. Furthermore, government and industry began to question the utility of university teaching with respect to the production of students with job related skills. In addition, both government and industry began to question whether curiosity-based research generated socially or economically relevant results that could be applied to the solution of social problems as well as contribute towards economic growth and development. Thus over the last generation, the university has been confronted by increasing pressure to generate trained workers and economically, politically or



socially relevant research. Such pressure threatens both the intellectual and financial autonomy of the researcher and the university. In the last two years, for example, both the Natural Sciences and Engineering Research Council and the Social Sciences and Humanities Research Council have been compelled by Government to match increased public funding with private sector support which generally involves applied as opposed to pure research projects.

The issue of training and research relevance however, represents only the most obvious sign of the cultural clash experienced by the modern university in the Information Economy. The substantive pressure for change is emerging from the evolving role and importance of intellectual property rights which serve as the basis for the industrial organization of the new economic process.

### *Intellectual Property*

The most important set of laws affecting the emerging Information Economy is intellectual property legislation. Like other forms of law, its nature and impact on economic behaviour varies according to national experience. The increasing importance of intellectual property reflects the gradual but general evolution of legal theory to account for more and more abstract forms of property such as *Good Will* and *Equity* in a limited liability corporation.

In the first instance, the results of university research become embodied in published articles subject to copyright protection. Copyright and other forms of intellectual property legislation are justified as a protection of, and incentive to, human creativity which otherwise could be used freely by others. In return, the State expects creators to make their work available to society as a whole, and that a market will be created in which such work can be bought and sold. But while the State wishes to encourage creativity, it does not want to foster harmful market power. Accordingly, the State builds in limitations to the rights granted to the creator. Such limitations embrace both *time and space*. Rights are granted for a fixed period of time, and protect only the *fixation* of human creativity in material form (Chartrand March 1985). It is intellectual property rights which form the legal foundation for the Information Economy. It is important to understand that copyright and other forms of intellectual property rights do not protect *ideas*, but rather the physical form in which they are expressed.

By way of example, copyright will be examined with respect to variations in national experience and the impact on industrial organization. In French-speaking and most Western European countries, *droits d'auteur* or *author's rights* are the core, of what in English-speaking countries, is called copyright. Such rights are rooted in the Republican Revolution of the late 18th century, and the *Rights of Man Movement*. Following the Communist Revolutions of the 20th century, the case in the Communist Bloc is similar yet different from that in Western Europe. While the moral rights of the creator are recognized through a one-time award, all subsequent rights revert to the State.

Moral rights are not, however, the historical root of copyright in the English-speaking world. Rather, in the 15th century with the introduction of the printing press, Tudor monarchs began to grant to *approved* printers the right to copy *approved* works, i.e. copyright. Thus, the roots of copyright are censorship and feudal grants of commercial privilege (MacDonald 1971: 14-16). These residuals of feudal and crown law did not vanish with the advent of democracy. On the contrary, they survived in attenuated form to plague democratic law and government. Obsolete in practice, they still influence *the spirit of the law* (Gray 1981: 108).

In English-speaking countries, therefore, copyright (and other forms of intellectual property) is traditionally the legal foundation of industrial organization of the arts. In European countries, *author's rights* are traditionally intended as a reward for creativity, and royalties probably play a more significant role in the economic status



of the artist than in the English-speaking world. The question does, however, require further research. Furthermore, in native or aboriginal cultures, the concept of *native copyright*, while not incorporated into statute, is based on yet another tradition. Specifically, among native peoples, the rights to a cultural work such as a song, story or icon do not belong to an individual but rather to the tribe or to one individual in each generation generally through matrilinear line of inheritance.

Emphasis in copyright on fixation in material form highlights the relationship between Innisian analysis (Innis 1951) and Carl Sagan's extra-somatic knowledge (Sagan 1977), i.e. the integrity of cultural messages in any transmitting media, whether durable or mobile, *depends on* the power of the State. In pre-literate societies it was the mnemonics of rite and ritual that encoded *extra-somatic* knowledge in oral communications media. The ability to record knowledge and maintain its integrity in the modern world is a function of technological change in communications hardware and enforcement of the abstract form of property called copyright (Chartrand 1987a).

The ability to vertically and horizontally exploit rights is a major source of national wealth and the focus of international copyright piracy. Copyright involves a range of rights including the right to market a work in a given country. If a copyright is sold or licenced in all countries and all geographic markets then the copyright is said to be *exhausted*. But beyond geography, copyright includes the right to adapt a work from one form into another, e.g. from a novel into a play into a motion picture. It also includes the right to translate a work from one language to another.

An extreme example demonstrates the cashflow implications of ownership of a copyright. Consider a book which through the sale or licence of its copyright, becomes a play. The play becomes a movie from which posters, a sound track, T-shirts and toys are spun-off. The movie is then broadcast on television and the sound track on radio and sold as a recording. A book is written about making the movie and the sequel to the film is made. Even works in museums and archives are involved in that copyright has lapsed through time and the works are in the public domain, open to exploitation by anyone. All associated income streams emerge from the initial copyright in the book. It is through exploitation of the revenue streams implicit in the grant of copyright that the commercialization of the arts and culture is possible.

It is increasingly important to ensure Canadian rights are recognized by foreign buyers and sellers. It is easier to penetrate foreign markets through sale or licensing of rights than through the export of manufactured products, e.g. it was the sale of rights from the British that created US TV money-spinners such as *All in the Family* and *Three's Company*. The recent sale of rights for an English-language version of the Quebec-made film *The Decline of the American Empire* is another example of how the Americans buy rights rather than successful finished cultural products.

The sale of intellectual property across national borders is also restricted by the Manufacturing Clause of the American Copyright Act which requires that no book by an American author be sold in the US unless it is printed in the US (Canada is currently exempted from this clause). In fact, France imposes the most sophisticated barriers to intellectual property. Thus if one enters Canada with a computer tape, tariffs are applied to the value of the physical tape. If one enters France with the same tape, tariffs are levied not on the value of the tape, but on *the value of its contents*. If, for example, computer software developed for the US market is sold at marginal cost in the French market, then equivalent French-based software will be under-cut in terms of price, and the competitiveness of French intellectual property will be reduced. If this principle were applied to American film and TV programs, they would be exposed to tariffs at the cost of production. Sale in a foreign market at less than that price would be *dumping*.

Traditional intellectual property legislation is subject to international convention. Canada is required to extend national treatment to foreign citizens, both individual and corporate. In fact, traditional copyright forms *the legal foundation for industrial*



*organization of the arts industry.* There exists, however, a class of intellectual property rights not covered by convention (so-called *parallel rights*). Such rights including *droite de suite*, i.e. rights of following sale for visual artists, which have been created in the US States of California and New York States and declared constitutional by the courts even though applicable only to citizens of those States. Such rights are a means by which the Government of Canada can still create incentives restricted to Canadians, e.g. Public Lending Rights.

Extension and development of copyright and neighbouring rights is a dynamic process which accelerates with the development and introduction of technologies which provide new ways to fix the product of human creativity in material form, and which in turn create new ways to pirate such products. Communications conglomerates have discovered that libraries of older films and television programs represent a capital asset worth millions of dollars in the form of videos, pay television, and syndication on ordinary television stations. This highlights another important difference between the arts and sciences. While new scientific knowledge tends to displace the old, in the arts the old repertoire often remains relevant for thousands of years, e.g. the impact of the *Tutankamen* exhibition on advertisers, or the continuing relevance of *Oedipus* by Sophocles.

Within the Information Economy, the arts are the most information-rich form of *final or consumer demand* for information. In contrast, scientific research represents the most information-rich form of *intermediate or producer demand*. The two form, in a manner of speaking, opposite sides of the same coin.

#### ALTERNATIVE STRATEGIES FOR UNIVERSITY RESEARCH IN THE INFORMATION ECONOMY

Not only do universities (reflected in statements made at the *National Conference on University Research and the Future of Canada*) object to the increasing pressure from both government and the private sector to *directed or targeted* university research, in fact the contemporary culture of university research stands in stark opposition to the evolving nature of intellectual property legislation in the Information Economy. The contrasting treatment of copyright in the arts and sciences will serve to demonstrate the clash between the culture of university research and the new economy. In the arts, no creator will knowingly allow his or her work to be exploited without royalties or other compensation being paid. By contrast, the university researcher voluntarily passes all copyright on a research article to the owner or editor of academic journals without compensation. While this is a well-rooted tradition based upon the desire to diffuse knowledge and to meet the *publish or perish imperative* of academic life, it flies in the face of the emerging Information Economy (*York Gazette* June 25, 1988: 4). If proposed copyright revision is successful, it will compel payment for photocopying of all published literature - both artistic and scientific literature. This would result in copyright owners, i.e. the owner or editor of academic journals and books, financially benefiting, not the researcher or the university (Chartrand 1987e).

Given increasing pressure on universities for *training rather than education*, for *directed rather than curiosity-based research* and for *payment rather than free diffusion* of copyrighted scientific research, it is critically important that the university adopt an appropriate strategy if it is to maintain its traditional autonomy. How can the university maintain its autonomy and obtain funding to support curiosity-based research? How can it minimize the impact on the traditional practice of research and, at the same time, maximize the benefits to the research community and the Canadian economy as a whole? There are three alternative strategies for university research in the Information Economy.

##### *Defensive Resistance*

The university could resist the pressure to become relevant and ignore the impact of new and emerging intellectual property rights. If it does so, however, it could result in the *marginalization of the university*. There could be a gradual decline in available



resources, both public and private, accompanied by the transfer of applied research and training to other institutions. This would eventually lead to a further decline in curiosity-based research as total university resources decline.

### *Collaboration*

The university could collaborate with the public and private sector to become *relevant*. This would lead to increasing exploitation by public and private sector sponsors of university research and researchers with a resulting *dual loyalty* of scholars to the university and sponsors. Dual loyalty is, in fact, becoming an increasingly important ethical question in emerging fields such as genetic engineering. Collaboration would still result in the decline in curiosity-based research as research resources and personnel become increasingly directed at applied research questions and scholars increasingly dependent on financial resources from outside the university.

### *Creative Offense*

Alternatively, the university could give *explicit recognition to the central role of university research in the Information Economy* and establish appropriate *terms-of-trade* with the public and private sectors. In effect this amounts to a variation on the old saying: *If you can't beat them, join them* - on your own terms. The university would increase its exploitation of all intellectual property rights inherent in work conducted by its tenured scholars. Revenues resulting from exploitation of such rights could be fed back to maintain and extend curiosity-based research which the public and private sectors are increasingly unwilling to support. Such a strategy would enhance the autonomy of the university.

An example will demonstrate how such a strategy could be applied. If new copyright restrictions are placed on the photo-reproduction of learned journals then the university community could insist that all payments be made to a central trust fund (a royalties collective) which would fund curiosity-based research. The trust fund would be administered by the university community itself through peer evaluation of projects proposed by scholars from all disciplines. Furthermore, to insure Canadian research is supported, the university community could insist that national treatment not be extended to foreign journals. Given that Canada is a net importer of research journals, this would minimize the balance-of-payments impact of the new legislation.

A variation would be to create reproduction rights *outside* of the formal *Copyright Act*, as with the *Public Lending Rights Commission* administered by the Canada Council. Such an strategy would insure national treatment is not provided, and more importantly that *payment for use* is made to the creator, not to the copyright holder, often a major for-profit corporation. The Public Lending Rights Program could serve as a model. Essentially it is based on the principle that library use of a book reduces earnings of its author. While society benefits from freedom of access, the author suffers. Accordingly, Government has the right and responsibility to insure equitable and just treatment. Accordingly, it has created a separate pool of funds paid to authors in compensation for library use. Libraries with very restricted budgets, do not pay. Government, in recognition of the just and equitable claims of Canadian authors and to promote the public interest in the free flow of information, pays.

The universities could also press for exemption of individual researchers and scientists from taxation on income generated by copyrights or patents. This measure has been adopted in Eire. Such measures would go some distance to make Canada a *creativity haven* for scientists and artistic creators. In fact, the 1990s may well be characterized by competition between countries to create tax regimes and other incentives to insure that creative personnel reside within their borders and thereby enhance national competitiveness.

Beyond application of the proposed creative offensive to copyright, the universities could expand their efforts to create *horizontal integration* of departments and faculties in order to exploit patent and other rights inherent in research conducted by tenured



staff. Thus the legal faculty could design appropriate employment contracts to insure the university benefits from patents and other property rights. The business administration and economics departments could conduct market analyses of the potential of research results. In fact, research and development could be conducted by graduate and undergraduate students. No interference with publication of research results would be necessary, rather a review of research would be conducted to ensure that the first chance at exploitation is available to the university.

In the arts, recent controversies in the United Kingdom involving Peter Hall of the National Theatre (*Les Miserables*) and Trevor Nunn of the Royal Shakespeare Company (*Nicholas Nickleby*) demonstrate how the non-profit institution can produce properties that generate large incomes for the employee of a non-profit institution. By way of contrast, in Canada, Brian MacDonald (who developed the highly successful Stratford Festival version of *The Mikado*) demonstrates that intellectual property developed by a non-profit institution can produce income not only for the creator but also for the host institution, if appropriate terms are established.

### Conclusions

The university is the traditional centre for the production and diffusion of knowledge in Western society. The Information Economy involves the *monetarization of information*. Contrary to a popular misconception, within the Information Economy no premium is placed on the free flow of information. Traditional university research, motivated by the search for *knowledge for knowledge's sake*, conflicts with the ethos of the Information Economy and this conflict threatens the autonomy of the university.

Through time, there has been a progressive expansion in the sources of National Income. In this century, technological change has become the most important source. However, understanding of technological change has also evolved. Today, there are three epistemological sources of what is popularly called technological change. Research in the physical sciences leads to improvements in physical technologies, the most obvious form of technological change. Research in the social sciences and humanities leads to improvements in organizational technology, i.e. ways and means to organize and motivate capital, labour and physical technology. Research in the arts leads to improvements in advertising, consumer research, marketing and product design. Physical and social science research is centred in the university. Research in the arts is focused in the non-profit professional fine arts community.

Research, in dollars terms, represents a small amount of resources compared to existing capital stock and labour force. However, its role in economic growth is that of a catalyst stimulating changes and improvements in the quality and efficiency of capital and labour. Research results become embodied in abstract intellectual property rights including copyright, patents, registered industrial design and trade marks. It is the buying, selling and licensing of such rights that constitute the Quaternary Sector of the Post-Modern or Information Economy.

Not only do universities object to pressure from Government and the private sector to *directed or targeted* research, in fact the culture of university research stands in opposition to the Information Economy. Compared to the arts, the university has been ineffective in exploiting such rights. This partially reflects that university research has traditionally been conducted without thought of financial gain. As the Information Economy grows and expands, the university has three alternative ways of adapting: *defensive resistance* leading to *marginalization* of the university as a social institution; *collaboration* with private and public sector sponsors in conducting applied rather than pure research leading to a dangerous *dual loyalty* on the part of tenured faculty; and *creative offense* giving *explicit recognition to the central role of university research in the Information Economy* and establishing appropriate *terms-of-trade* with the public and private sectors to insure the autonomy of the university and funding for *curiosity-based research*.



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